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INSTITUTE

Colony of Seychelles.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR 1930.

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ANNUAL REPORT

OF

THE DEPARTMENT OF AGRICULTURE

FOR THE YEAR 1930.

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General Remarks.

The year under review is notable for the following events :

1. The fall in the price of copra and essential oils on the home markets.
2. The record crop of coconuts for the past year.
3. The introduction of pure bred Friesian dairy cattle from Mauritius.
4. The employment of a specialist in essential oil distillation by the Seychelles Produce Company Ltd.
5. The unsuccessful introduction of a parasitic fungus from the Imperial Mycological Institute and the independent discovery of the same fungus attacking the thread scale in a few localities.

II. Expenditure, Receipt, sale of plants.

	Rs. c.
Receipts from plantations	1,263.42
Sale of timber from Crown lands	107.66
Rents of Crown lands and buildings	25,794.69
Royalty and export duty on guano	13,938.00
Royalty on timber from Aldabra	246.63
Total Receipts ... Rs	41,350.40

The total Expenditure under Agriculture and Crown Lands amounted to Rs 31,009.24

III. Introduction of plants.

Among the plants successfully introduced during the year the following may be mentioned :—

Tephrosia vestita	from Java
Yellow maize (varieties) ...	,, ,,
Ceiba pentandra	,, ,,
Lansium domesticum	,, ,,
Corypha umbraculifera ...	,, ,,
Garcinia mangostana	,, ,,
Achras sapota	,, ,,
Nephelium mutabile	,, ,,
Cassia Timoriensis	,, ,,
Pinanga coronata	,, ,,
Livistona rotundifolia	,, ,,
Licuala humilis	,, ,,
8 varieties of soy beans ..	,, ,,
Euterpe oleracea	,, ,,
Various alocasias	,, ,,
Pinanga Malayana	,, ,,
Carica papaya	,, ,,
Pinanga Kubilii	,, ,,
Cyrtostachys renda & Lakka ...	,, ,,
Melinis minutiflora	,, Ceylon
Paspalum lerrana	,, ,,
Spathoglottis orchids (3 varieties)	,, ,,
Amaryllis purpurea	,, ,,

Casuarina quadrivalvis ...	...	from Hawai
Achras sapota ...	...	,, ,,
Calamus rotang ...	...	,, ,,
Livistona australis ...	...	,, ,,
Pritchardia filifera ...	...	,, ,,
Peltophorum dasyrachis	...	,, ,,
Cowpeas, crotolarias ...	...	,, Kenya
Peppermint ...	...	,, ,,
Juniperus procera ...	...	,, ,,
Cedrela toona ...	...	,, India
,, odorata ...	...	,, ,,
Cassia hirsuta ...	...	,, ,,
Robusta coffee ...	...	,, Madagascar
Achras sapota ...	...	,, Trinidad
Chrysophyllum cainito ...	...	,, ,,
Melicoca bijuga ...	...	,, ,,
Acrocomia intennescens	...	,, Brazil
Attalea indaya ...	...	,, ,,
4 varieties of sorghums	...	,, Tanganyika
Achras sapota ...	...	,, Malay States
Dwarf coconuts ...	...	,, ,, ,,
Brazil nuts ...	...	,, ,, ,,
Mauritia flexuosa ...	...	,, British Guiana
Melicoca bijuga ...	...	,, ,, ,,
Chrysophyllum cainito ...	...	,, ,, ,,
Achras sapota ...	...	,, ,, ,,
Astrocaryum tucuma ...	...	,, ,, ,,
Yucca purpurea ...	...	,, Italy
,, tricolor ...	...	,, ,,
,, quadricolor ...	...	,, ,,
Hibiscus mutabilis ...	...	,, ,,
Pennisetum luppelianum	...	,, ,,
Aleurites Fordii ...	...	,, Kew Gardens
,, Montana ...	...	,, ,,
Latania aurea ...	...	,, Mauritius
Cassia florida ...	...	,, ,,
Hybrid eucalyptus ...	...	,, ,,
Mimusops elengi ...	...	,, ,,
Sweetenia macrophylla...	...	,, Panama Canal
Ampelocissus martini ...	...	,, Philippines
Nicotiana tabaccum ...	...	,, ,,

Among the cover plants which were introduced in 1929 and 1930, the best results were obtained from Centrosema pubescens and indigofera endecapphylla, especially the latter, which is extremely vigorous, strikes roots easily from cuttings and is eaten by cattle. The other centrosemas made very good growth, vigna hosei is susceptible to fungus attack by Rhizoctonia solani ; and Calopogonium dies out during the rainy season. Tephrosia candida does well but is severely attacked by the mealy bug (Icerya seychellarum) and has to be replanted every year. The crotolarias and other tephrosias do well, but they are also handicapped by mealy bugs. Another tephrosia (T. noctiflora) was found growing wild in W. Mahé.

Centrosema pubescens and Tephrosia candida seem so far to be more suitable in coral ground than the others.

Very good growth in the low country was made by the two acacias (confusa and polystachya) mentioned in my last report. They are plants which are excellent as cover crops and besides afford a very good fuel, being quicker in growth than casuarinas.

The two species of Tung oil plants, grown from seeds received from Kew, have successfully resisted the rainy weather, although a few lost their leaves when the drainage was not good. The best plants of Aleurites Fordii in poor soil reached 2½ feet high, 8 months after planting. In the drier district of Praslin, the growth was not so good, the soil being much poorer in that locality. On the hills at Niol, the rainfall which is above 150 inches is too much for them. 3 plants of Aleurites Montana were set out at the Botanic Station towards the end of the year.

The Chalmoogra plants on Hermitage estate are making good growth. One plant only of Taraktogenos was raised from seed and it is the best type of the lot having reached 15 feet high in 3 years. The two Hydnocarpus (Anthelmintica and Wightiana) have not done so well, specially the Anthelmintica variety which is very susceptible to water logged soils.

IV Distribution of information on Agricultural matters.

An attempt was made in 1929 and 1930 to start an agricultural census. It has been found that :—

The total area in farm amounts to 95,158 acres, distributed as follows :—

Mahé and neighbouring islands	27,307 acres
Praslin group	13,304 „
Outlying islands	54,547 „
Total	95,158 acres

This area consists of :—

A. Coconut plantations	28,240 acres
B. Herbaceous crops (including Patchouli)	508 „
C. Permanent meadows and pastures	6,023 „
D. Land for growing trees and shrubs	8,526 „
E. Land under forest (excluding mangrove swamps)	2,500 „
F. Other productive but uncultivated lands	13,597 „
G. Unproductive lands consisting of outcrops of granite following erosion and coral reefs still in their position of growth in the outlying islands	35,764 „
Total	95,158 acres

Herbaceous crops, maize	200 acres
peas and beans	3 „
manioc	60 „
sweet potatoes and yams	100 „
sugar cane	26 „
tobacco	45 „
vegetables	17 „
patchouli	40 „
various	17 „
Total	508 acres.

Other trees and shrubs :—

coffee	30 acres
bananas	175 „
citrus	20 „
pine apples	15 „
lemons and oranges	20 „
cocoa	20 „
black pepper	20 „
rubber	100 „
berries	6 „
breadfruit	500 „
jack	100 „
cinnamon	6,000 „
nutmeg	10 „
clove	10 „
various	1,500 „
Total	8,526 acres

Farm labour under 15 years	1,374
„ „ „ 15 „ old and over	6,141
Fishermen numbering	1,100
Total	8,615

COPRA MARKET. Information as regards the fluctuation in the price of coconuts and copra on the local market for the last 40 years was supplied to the Agricultural Board, and an article was published in the local paper on the subject. 1,000 nuts were worth Rs 12 to Rs 20 from 1890 to 1906 ; from 1906–1928 Rs 20 to Rs 56 ; Rs 30 to Rs 20 in 1929 and 1930.

FISH REFRIGERATION. A scheme for the establishment of a fish refrigerating plant in Seychelles was submitted during the year by a local firm. This application is under consideration by the Development Fund Advisory Committee.

LABORATORY SCHEME. Another scheme under the Colonial Development Fund was also forwarded at the same time to the Right Honourable The Secretary of State by His Excellency The Governor to provide for the equipment of Agricultural laboratories and for the purchase of a few acres of madreporic land for experiments on manuring and for the erection of a small essential oil distillery at the Botanic Station.

FERTILIZERS SCHEME. A grant of loans from the Colonial Development Fund was sanctioned under which chemical fertilizers, to the amount of £3,000 per annum during 3 years, were to be sold at cost price to coconut and other planters, the total sum to be repaid by 5 equal instalments commencing two years after the issue of the loan ; interest @ 4o/o to be paid during the last five years and to be calculated from the date of issue of the loan. Only 6 planters took advantage of this offer to the amount of £500 worth of fertilizers which have been ordered from England. Other fertilizers (phosphatic guano) to the amount of £125 will be purchased locally.

The system adopted in the West Indies is to give fertilizers free only to those planters who are willing to run experimental plots on their estates, at their cost, under the control of the agricultural department. It is very likely it is this system which will be adopted here. It is not to be believed that these plot experiments can be planned without difficulty. There is a large variability in fruit trees, and soils are very heterogenous in the tropics, especially in small islands. The following information is laid down just to show to local planters what is the problem they have to solve for themselves with the assistance of the agricultural department. A crop of coconuts over a period of years is very variable and the cœfficient of variability may be put down as being at least 20 o/o. After 15 years experiments at East Malling on apple trees, it has been found that to prove a 20 o/o difference, eight replications of individual plots are required. The experimental plot has therefore to be so arranged that each manurial trial distributed at random has to be replicated 8 times, which means 64 plots, in order to reconcile the experiments themselves with the mathematical concepts which are used to test their accuracy. As each plot has to be surrounded owing to wide root range by a double guard row of trees with the space between the double row unmanured, only about $\frac{1}{4}$th of the trees on a given ground can be included in the experiment. Only one or two manurial plots of this kind can be established under the direct scientific control of the Agricultural Department. On other estates the W. Indian system will be adopted here. It consists of 5 or 6 plots of several trees or even 1 acre each, parallel to one another, each plot receiving a different dose of complete manure and one being left unmanured as the control plot. This would lead to general results being obtained, but these results would have to be corroborated by other elaborate scientific experiments made on modern lines.

AGRICULTURAL CONDITIONS IN SEYCHELLES. Two agricultural bulletins were published in 1930. An address delivered by the Director of Agriculture at a meeting of the Agricultural Board in December was reproduced in Bulletin No. 11. A mention was made in the address of all the factors governing the establishment of new industries in the Colony viz :—

1. Agricultural factors.
2. Climatic factors.
3. Botanical factors.
4. Biological factors.
5. Economic factors.
6. Educational factors.

Much stress was laid on the difficulty of making good the influence of so many factors at the same time. This difficulty goes far to explain why so few industries became established in the past, in spite of the numerous plants that have been introduced of which the following are mentioned :—

1.	Tea Assam hybrids	in 1903.
2.	Cocoa of the forastero annual avocado, Nicaragua...	„ 1906.
3.	Nutmegs	„ 1904.
4.	Robusta, Excelsa, Stenophylla coffee	„ „
5.	Kola nuts	„ „
6.	Coca	„ „
7.	Camphor	„ „
8.	Palm oil (hard and soft shelled varieties)	„ „
9.	Ramie	„ „
10.	Tuba root	„ „
11.	Sisal and Hennequen	„ „
12.	28 of the best fruit trees	from 1904—1927.
13.	Ajowan seeds	„
14.	Gutta percha	„
15.	Benjoin (2 species)	„
16.	Cardamom	„
17.	20 different timber trees	1910—1927.
18.	12 „ fodder grasses	„ „
19.	Rattan palms	„
20.	Borassus, areca, cohune, dwarf coconut, grugru palms	„ „
21.	Ginger from Jamaica and Cochin	1923.
22.	Groundnuts	„
23.	Cover plants numbering 24...	1923—1927

24.	Ground provisions including Banana (Gros Michel) and several varieties of manioc, sweet potatoes, rice, maize, sorghums, edible aroids and yams	..	...	1904—1927.
25.	All spice	...	...	1924.
26.	Tung oil trees	...	...	1929.
27.	Peppermints	...	...	1926.
28.	Geranium	...	...	1924.
29.	Kapok, the new species	...	...	1928.
30.	6 different rubber plants	...	...	1902—1914.
31.	Tobacco (the best strains)	...	...	„ „
32.	Divi divi	...	...	1904.
33.	Ravinsara	...	...	1924.
34.	Strychnos nux vomica	...	...	1911.
35.	Palmarosa	...	...	introduced in 1928 by Mr Devaux.
36.	Neroli and Bergamot	...	...	„ 1911 by Mr d'Emmerez.
37.	Chalmoogra	...	...	„ 1928.
38.	Gum copal	...	...	1910—1927.

HARDPAN IN THE OUTLYING ISLANDS. The following information was obtained from the Imperial Institute regarding specimens of hardpans and beachsandstones collected in the outlying Islands at the end of 1929. A chemical analysis of both materials from Desroches and Providence gave the following results :—

		Hardpan Providence				
		1.	2.	3.	4.	5.
	Limestone Desroches				In subsoil 3 to 6 feet deep.	In top soil 1 to 2 feet deep.
Lime C O o/o a	51·10	47·79	47·07	47·13	51·20	51·20
Magnesia Mgo o/o	2·38	1·88	1·82	1·65	2·64	2·68
Silica Si O o/o 2	0·08	nil	nil	nil	nil	0·03
Alumina Al O o/o 2 3	0·23	trace	0·04	trace	0·04	0·07
Ferric oxide Fe O c/o 2 3	0·10	trace	trace	0·02	0·03	0·05
Soda Na O o/o 2	0·46	0·35	nil	1·34	Not estimated	
Potash K O o/o 2	nil	nil	nil	nil	„	„
Carbon dioxide CO o/o 2	42·86	22·72	24·94	10·88	42·46	42·07
Sulphuric anhydride SO o/o 3	0·45	0·42	0·38	1·21	0·45	0·45
Chlorine cl o/o	0·15	...	...	...	...	...
Phosphoric anhydride P O o/o 2 5	nil	17·61	14·62	28·93	0·40	0·75
Organic matter and water o/o	1·90	0·93	10·57	8·20	0·13	2·52

Some of these hardpans contain a high percentage of Phosphates and can be used after grinding as phosphatic guano.

VI. The Coconut Industry.

The coconut crop for 1930 may be apportioned as follows as compared with that of the 5 preceding years :—

	1926	1927	1928	1929	1930
Nuts converted into copra ...	37,912,000	29,978,000	34,825,000	31,921,750	41,933,500
„ „ „ oil ...	259,000	68,200	48,200	9,090	93,000
„ „ „ soap ...	...	...	10,000	10,000	400,000
„ exported as such ...	83,000	12,500	27,500	19,360	
„ consumed locally ...	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
	42,254,000	34,058,700	38,910,700	35,960,200	46,426,500

The above figures were obtained from the Trade returns that are published by the Collector of Customs. As the crop for 1930 was so much larger than the preceding ones, the way in which the trade returns are computed were closely examined. It was then found advisable to obtain for comparison the shipping company's returns for the same period. These returns go to show that 530 tons were exported in January 1930 which evidently belong to the crop for 1929 and that only 250 tons were exported in January 1929.

It is difficult to draw a line of demarcation between the crop for any one year and that for the preceding year, as the Colony consists of islands that are scattered about over a distance of 630 miles in one direction and 150 miles in another from the centre of exportation. Nobody knows exactly if the copra exported in one year represents the crop for that year, as the copra is often delayed in transit from want of regular and rapid communication with the Outlying islands. There is besides a considerable difference between the copra shipments recorded by the customs officials for any one month of the year and the amount really shipped in accordance with the books of the shipping company. Furthermore in January and February 1929 the Customs and the Shipping Company show an exportation of 430 to 460 tons of which a certain amount, difficult to appreciate, also belongs evidently to this 1928 crop. If this exportation for January 1930 is to be deducted from the total exported during that year, allowance must be made for a similar deduction in 1929. There is besides a discrepancy of some 800 tons between the total exported in 1929 according to the trade returns and the figures revised in the light of the Shipping Company's records. According to the Shipping Company's books the crops for 1930, 1929 & 1926 are virtually the same, that of 1930 being a record crop by only a few tons.

	1926	1927	1928	1929	1930
Trade returns ...	5,400	4,200	4,900	4,583	5,910
Shipping Coy. ...	5,416	4,847	4,885	5,435	5,460

The coconut crop is governed by so many factors that there is always a tendency on the part of planters to attribute a predominating influence to one of these factors and to ignore the others. The rainfall in 1928 was very good (135 inches) ; it was about 50 inches shorter in 1929 and 1930. If the theory by which it is said that the influence of factors governing the crop takes place 2 years before the harvest time much of the large crop for 1930 can be due to climatic factors with the results that the influence of other factors (mainly scale insects disease) was obliterated. It is when all adverse factors combine together that very poor crops are obtained. A period of overbearing in coconut plantations is also generally followed by a period of underbearing in Seychelles and this anomaly will always show itself so long as manuring on modern lines will not be practised. The use of fertilisers is the only means of counteracting adverse governing factors, such as deficient rainfall, scale insects and overbearing.

A considerable amount of soap and oil was made in 1930 for local consumption, owing to the slump on the copra market which caused locally a reduction of 50o/o in the price of this commodity. I consider that at least 400,000 nuts were converted into oil and soap for the year under review. (It is probable that 3 times that quantity are nearer the mark). A great many other estates have reached the same crop as last year or even a larger one both in the Mahé and Praslin groups. It is difficult to obtain figures from planters and keep a record of new plantations, but an attempt will soon be made by the Government to be supplied with quarterly returns which will be tabulated. The system of interplanting coconuts is exaggerated in Seychelles and plantations are known which harbour 50 to 150 trees per acre and therefore comparative figures between estates and between annual returns are vitiated, as the overcrowded trees bear less than up to date plantations and as many interplanted young palms never come into bearing in the shade of others, although they would figure in the returns.

Many estates that have recorded a deficit have not suffered on the same scale. For example a group of estates where the scale diseases are at their worst (temporarily) showed figures which are only 10 o/o lower than those for the year before and a reduction of 10 o/o is not necessarily exceptional. It occurs every year under the spell of climatic factors. The rainfall of this colony varies so much that it shows a difference of over 50 o/o from one year to another.

The havoc done by insects is in many places more and more alarming, but in other places it was just as alarming several years ago without any artificial methods of control having been adopted. The havoc which caused a panic in 1923 and 1924 when the yellow scale was at its worst and even later was something of the past, but it recurred again this year when the thread scale increased in number. A broad area in the North, where coconut palms have been planted for the first time in unsuitable land ruined by erosion and shifting cultivation in the past, is still at present severely attacked by yellow scales. It gradually became infected year by year for the last 10 years without any measure having been taken to combat these pests, in spite of repeated warnings. Coconut culture with a crop selling at Rs 20 a thousand nuts is not a paying proposition in such localities and will never be. Lower down the coconut palms are very seldom attacked in the same way, except in a few patches of ground that are waterlogged or deprived of food elements. In these patches the lower leaves of the palms are all intensely covered with scales, but in others the same scales are not so abundant and the crop is maintained. These virulent attacks which lead to fall of nuts before maturity are not common and they will be gradually decreased owing to the presence of natural parasites (which will be discussed in another chapter) if the weather conditions are favourable.

At all times in Seychelles scale insects were rife. 50 years ago or more it is said that the Icerya Seychellarum scale (this scale is not known at present to attack coconut) practically smothered all the leaves and nuts; this was followed by an invasion of Chionaspis scales of which there are 3 species in Seychelles; again, some 20 years after, the Aspidiotus ficus scales scared many planters who alleged that the pest was comparable to a conflagration that had burnt their estates. At the same time 5 other different scale insects attacked the midribs and leaf stalks of the palms and all these epidemics have apparently dwindled away into insignificance under the control of natural parasites. It is also believed in Seychelles that when the attack by Icerya scales occurred it was combated by a coccinelid (Rodolia chermesina) introduced from Bourbon to the relief of the inhabitants. There are very few of these coccinelid beetles left, but various things go to show that chalcid flies are numerous and that fungus parasites are also very beneficial. But the same parasites cannot be used in all cases. Every insect has its parasites, co-parasites, hyperparasites, etc. It is for this reason that for the last five years the services of a specialist have been applied for in order to introduce beneficial parasites against the two scales that are so troublesome at present, without introducing other pests. But it has to be borne in mind that the scales when once obliterated or destroyed by the parasites, these parasites will die out, and others will have to be introduced for combating other scales, as the coconut palms are virulently attacked by at least six scale insects. Such introduction which has to be varied according to the prevalence of such and such insect in the plantations is a work of considerable delicacy and cannot be attempted without going into heavy expenses and without the services of a full time entomologist trained for that purpose for years. An attempt to introduce predatory insects cannot be seriously considered, unless these various elements of success are assured by the Home Government and a breeding station established on the spot.

It is however a never ending piece of work which has to be kept in activity for ever in a Colony like Seychelles where scale insects, minus their natural parasites, are so rife. Even if this work were done properly, the other agricultural methods of combating scales should be provided for by giving the trees a greater power of resistance, following cultivation and manuring of the soil and terracing the land, without which in the tropics there is no lasting remedy against insect attack.

It is desirable that nuts should be selected for the improvement of local strains which yield very small nuts. A certain amount of selection was attempted as far back as in 1906, and Ceylon nuts numbering over 10,000 were introduced at the Botanic Station and again in 1911. These Ceylon nuts which yield nearly double the amount of copra as compared with Seychelles nuts did not find favour with the planters. The trees derived from them which are used to clean cultivation and manuring in Ceylon, did not altogether do as well as the more hardy Seychelles palms which are so often allowed to grow in the jungle without cultivation, but there are very good trees of Ceylon strain left in Seychelles from which very good nuts are already being selected for planting. Among the Seychelles strains there are here and there also a few varieties, such as coco raisin, coco rond, etc. which are selected as seed bearers and during the year under review the famous dwarf coconut was introduced from the Malay States. Selection of nuts for planting is therefore not handicapped by want of good varieties and if manuring is taken up in Seychelles as it should, the cost of manufacturing copra would be considerably lowered, as 4,500 nuts go to a ton in many countries, while in Seychelles an average of 7,000 nuts is required for the production of the same amount of copra.

It is also often forgotten that during years of abundant rainfall the nuts in Seychelles are much bigger: 6,000, and even less being needed for the production of 1 ton of copra, while in the drier districts where the rainfall is often reduced to 50 inches or the dry season more extended than in Mahé, the number of nuts required per ton of copra reaches and often exceeds 8,000.

Our method of curing copra, although primitive, gives good results. The Colony was provided with the Ceylon platform system in 1903 and a very simple curing house in which the hot air drier, the platform and sliding roof system are combined or used alternately, according to weather conditions, has been gradually elaborated with success. A Civil engineer from France, Mr Tritschler was, 20 years ago, instrumental in establishing on modern lines hot air driers which have more or less served as models on a reduced scale to the other planters of the Colony.

VII. Essential Oils.

The production of essential oils in the Colony for 1930 shows a decrease over 1929 and compares as follows with the average for the 5 previous years:

	1924—28	1929	1930
Cinnamon leaf oil, litres	47,599	66,311	50,478
„ bark „ „	38	—	—
Patchouli „ „	1,252	4,334	2,341
Basilic „ „	71	4	23
Lemon grass „ „	146	—	—
Clove leaf „ „	975	38	—
Total	50,081	70,687	52,842

The production is due mostly to fall in the price of cinnamon leaf oil which is nearly all exported to the United States of America and partly to the bushes being in many places exhausted by over-cropping without manuring and cultivation. There is also a slump in the market of Patchouli oil.

There are 87 distilleries in the colony, some of which were closed down during the year under review. Half the number of distilleries in working order are imported stills with steam distillation, the other half are locally made ones with direct fire distillation. The yield of oil per ton of leaves is a little over 7 litres, as compared with 7½ litres which are the official figures from Ceylon. Many of the locally made stills yield quite as much oil as the imported ones and the worst types are imported stills that have surely been designed for distillation of material other than cinnamon leaf. Stills purchased from the well known firm Deroy fils aîné, Paris, are in great favour, although a few small stills supplied by a German firm have been found to yield more oil than the others. Much remains to be known as regards the best method of distillation of essential oils in the Colony which is handicapped by the absence of a competent mechanical engineer conversant with distillation of leaves in the tropics, the method of distillation and the type of the stills having to be modified in accordance with the specific gravity and composition of the oil obtained and with the texture and composition of the leaf under distillation. A specialist from England recently arrived in the Colony under employment by a private firm. He has already shown that the yield of oil can nearly be doubled in some cases, reaching 11 litres per ton. The yield of 11 litres per ton has however been often obtained in this Colony, especially from leaves that had been gathered from trees which had remained uncropped for several years. There is a well-known distinction between the yield of leaves from twigs one year old and that from twigs that are over 2 years, although cinnamon bushes drop their leaves after 14 months. The dropped leaves are never distilled, as in the case of clove leaves, but in the old twigs the active principles seem to undergo that kind of metabolism that is needed for the maximum elaboration of essential oils in the leaves. This process of metabolism is not advanced far enough in the younger twigs from which the leaves are plucked every year. There is very little difference in the leaves of the species of cinnamon grown in the Colony. Although leaves are smaller and pointed in some localities, mostly at Silhouette, the bushes nearly all show broad and short leaves that are known as yielding the best oil in Ceylon. When cinnamon was introduced from Ceylon in 1762 it is very likely that only a few seeds or plants from the best Ceylon strains were imported ; while in Ceylon, where cinnamon is indigenous, there are much greater incidental variations in the species grown. Even different species are known to occur in that Colony while no cinnamon is indigenous in Seychelles. The poor yield of oil in some localities in Seychelles cannot be due to the wrong species or variety of trees. It is more likely that it is the method of distillation which is at fault.

It is well known that the firm Deroy fils aîné manufactures stills for Madagascar and the Comoros and that the firm in question is conversant with the texture of cinnamon and cloves that are distilled in those colonies. The same cannot be said of all European firms which manufacture stills for exportation into the tropics. This accounts sufficiently for the great variation in the yield of essential oils in certain districts of the Colony. It has been found by an experienced local planter that wide vats containing 1 ton of leaves yield less oil than smaller and narrower vats and that even in large vats the yield is better, if only 1/3rd of the vat is packed with cinnamon leaves, other conditions being equal.

All these observations warrant the question of distillation of essential oils being examined from all its sides by direct experiment in the Colony where the climatic conditions are so favourable for the manufacture of essential oils. It is proposed to obtain the services of an expert mechanical and chemical Engineer conversant with the modern methods of distillation in order to modify the local distilleries and adjust them in such a way as to obtain the maximum yield. Cinnamon leaves are said to contain sometimes as much as 18o/o of oil but this content appears to be very variable. Hence the necessity of studying chemically on the spot the various materials for distillation with proper laboratory equipment, if any progress is to be made and the working expenses of the distilleries reduced to a minimum. Time has come for the mechanical and chemical control of distilleries in order to lower the cost of production and compete with synthetic substitutes.

During the year under review much progress was made in the extension of the introduction of : —

Peppermint—Mentha piperita and arvensis
Palmarosa—Cymbopogon Martini
Eucalyptus citriodora
All spice—Pimenta officinalis
Cardamom—Elletaria cardamomum
Lemon grass Ceylon and local strain
Ginger—Zinziber officinalis
Pepper—P per nigrum
Nutmeg—Myristica fragrans
Neroli—Citrus bigaradia
Bigarade—Citrus mitis
Ambrette—Hibiscus abelmoschus

Most of these plants are known to produce excellent oils by distillation. If seed or root crops such as ginger, cardamom, pepper are not properly grown, manured and cultivated in the poor soils of the Colony, the produce obtained from them will not stand competition with the same articles from Colonies where the soil is richer ; but nothing prevents essential oils being obtained from most of these perfume and spice plants for exportation, except the ambrette which produces an oil which cannot keep a long time, according to the authorities of the Imperial Institute.

VIII. Minor Crops.

BANANAS. This crop is not exported either in the raw state or manufactured into fig bananas. At one time a considerable number of bunches of the Elephant's trunk variety was exported by the Messageries steamers to Aden and Suez ; and those of the Congo type : Banane malgache and St Jacques turned into carottes (slices dried in the sun after slight exposures to fire) were exported to Mauritius.

Signs of a fungus disease were noticed especially on the bulbs of banane gingeli and specimens were submitted to the Imperial Bureau of Mycology for identification. A fungus was found in the vascular bundles of the stem which looks like the fusarium described by Dastur in India but is not the fusarium causing panama disease. The local disease is not necessarily fatal and progresses from the top downwards, whereas in Panama disease the plants wilt rapidly, the disease is always fatal, and the attack begins under ground.

VANILLA. The crop during the year amounted to 3,636 kilos and compares favourably with the previous crop on record. Both these crops were better than that of 1928. Excellent vanilla is still grown at Praslin where the climate is drier but the market price for that commodity is still too low to allow the culture of this orchid, which is so well understood by our planters, being revived. Even in Mauritius a prohibitive import duty is levied to protect the local plantations from competition and artificial vanillin has driven vanilla from the European market, except in countries, such as France, where a preferential tariff still allows vanilla being exported to that destination from French Colonies like Bourbon, Tahiti &c.

CLOVES. Clove was introduced into the Colony during the French occupation and many groves still survived some 20 years ago. The trees have all been exploited since then for the extraction of essential oil from leaves, but as they were very lofty trees they had to be cut down murderously to get at the leaves. None of them are left. The younger trees that had been planted mostly at Misère are still living, but they have also been very roughly treated for the cropping of their leaves, although in some cases one part of the tree only was cropped at a time. Cloves grow slowly in Mahé, but make better growth in Praslin which is drier. The soil, although poor, is good for that spice plant and its culture should not be abandoned as there are very few countries in the world where it has succeeded. At one time cloves were exported and the commodity was considered as having the Penang character by the authorities of the Imperial Institute. This tree is however better adapted to the manufacture of leaf oil than to the production of cloves, as it flowers irregularly in the Colony. Two planters still keep it in stock and have succeeded in nursing it by growing the seeds in a portion of coconut husk until the seedling is big enough to be set out with the subtending husk.

PEPPER. This spice plant was also grown in former times mostly on boulders under coconut shade Attempts are being made by a planter on the hills to grow it in the sun where it has just been set out on tripods of hard wood. This is the best method of growing pepper in the Colony, but the tripods of hard wood, such as capucin, should be 14ft. long with 4ft. in the ground in order to allow sufficient space for the development of the lateral branches which produce the crop. These branches do not strike root easily and runners from the base of the vines are preferred, although the Malayan method of selecting cuttings from the lateral twigs is generally considered as being preferable. The spikes are long enough but not as fully packed with fruits as in the East, but this may be a question of soil, climate and manure as well as a varietal difference. It has however been decided to get cuttings from Ceylon, and S. India the importation of seeds from Java not having succeeded hitherto and this method of propagation being much slower than the other. At one time a little pepper was grown on the hills in poor soil and the produce although light in weight was found to compare favourably with that of Penang and Singapore by the authorities of the Imperial Institute in 1901. Pepper has to be manured heavily in this colony with burnt earth and fish guano to make it a paying crop.

COFFEE. It has to be borne in mind that coffee of the Robusta and Stenophylla types requires good soil. When the laterisation of our red soil is far advanced and so deprived of humus the soil is too poor for coffee except in valleys. This plant grows better in basic soils derived from basalt which occurs here and there in the Colony when laterisation is less advanced. Red soil derived from granites must be heavily manured if it is destined to coffee. The best coffee (robusta) grown in the Colony is at Frigate Island in alluvial soil, 15 feet deep, at the foot of the hills. Already some of it is sold in local shops and is competing with Kenya coffee. Coffee from Aden which is of quite inferior quality is still imported to the amount of 71 tons a year worth Rs 30,000. At one time Liberia coffee was grown in the Colony, but the plantations were wiped out by the green scale until the time when the parasitic fungus kept in check the bug. Then the plants that had survived again came into bearing and are still producing an abundant crop. In 1901 at the Imperial Institute Liberian

coffee from Seychelles was considered of a very bold yellowish type. For some reason this coffee is much more appreciated by the residents than Aden coffee and, in fact, its flavour is excellent. But no coffee can grow in poor soils. Under such conditions in this Colony the scale insect, in spite of the fungus parasites, would soon reduce the crop to insignificance.

NUTMEG. A little nutmeg originating from seeds imported from Ceylon in 1904 is being propagated on one estate this year. The nuts and mace were favourably reported upon by the authorities in England. This tree does better on the hills than in the low country where it grows much more slowly and takes a long time to get established. Our nuts are small as compared with Ceylon and Grenada nuts and it is advisable to get fresh consignments from the latter islands. Some of the Ceylon nuts are giving excellent results on Mamelles estate, but the crop is still small in that locality.

ALL SPICE. This plant which was on several occasions introduced from Mauritius is doing well at the Botanic Station and as usual there is a great difference in the crop of fruits obtained from individual trees. Some trees do not bear at all or are very shy bearers and others bear abundantly. The "dumb" or "male" trees are cropped for their leaves and the heavy bearing trees produce fruits which are just dried in the shade before maturity and exported. Essential oil from leaves and dried berries obtained at the Botanic Station were submitted this year to the Imperial Institute for valuation. On several occasions seeds of the other all spice plant, pimenta acris, or bay oil were introduced without success from the West Indies. The seeds did not germinate at all. It is advisable to make a new introduction of this spice plant which has hitherto been jealously guarded against exportation, in St Lucia, Jamaica, or Leewards Islands. From a few other colonies seeds were received as being pimenta acris (bay oil) but turned out to be Pimenta officinalis (all spice).

GINGER. This spice plant does not do well in the Colony. The roots are thin and not plump as in Cochin and Jamaica. It is more like the Sierra Leone ginger which is often kept uncropped in the ground, owing to low prices, and harvested the following year when prices are better. There is no doubt that, unless properly manured with phosphate of lime, nitrogen and potash following a dressing of good compost and cultivated in trenches, no ginger can be grown in the Colony for exportation. A bacterial disease following growth in poor soils has been found to occur which may account for the absence of plumpness in the rhizomes. Poor rhizomes should better be distilled locally for manufacture of ginger oil than exported. Ginger oil distillation from green rhizomes is however a difficult piece of work and needs expert advice owing to the swelling of the starch grains. A few plants from Cochin and Jamaica were obtained in 1926, but did not do better than the local types originally obtained from India viâ Mauritius.

TURMERIC. This spice grown as a garden plant gave excellent results at the Botanic Station. A red variety from Mauritius was introduced in 1929 and produced more than a lb of roots per plant. It seems artificial in Seychelles to import an article of that kind.

ONIONS. For 25 years the culture of Teneriffe onion was recommended on the Outlying islands where the soil and climatic conditions are more favourable than in Mahé. It is hoped that a new attempt will be made with the seeds that have been ordered from the Canary islands, previous consignments ordered from the same source not having been made use of at all in the past. 74 tons of onions are imported into the Colony.

CARDAMOMS. The two varieties, Mysore and Malabar, were introduced in 1903 from the best Ceylon plantations. It is only this year that a planter applied for suckers. He set them out in a piece of jungle where the soil appears too poor for a crop which is so exacting in its requirements. Only the best forest soil is used in Ceylon if a good article is to be produced. The fruits from the poor soils should better be distilled locally than exported.

GROUND NUT. Nuts were obtained from Gambia, Sierra Leone and Mauritius, but this plant does not do well at all in Mahé where the soil is so poor and the climate so wet that most of the nuts are seedless. It is another crop which is more adapted to the Outlying islands rich in guano deposits, like all ground provision crops (maize, sweet potatoes, manioc, etc.) where the soil is uncommonly rich, containing more than 10% organic matter and proportionately rich in all other elements, except potash.

PERFUME PLANTS. New plantations are being made with Ylang-Ylang, Palmarosa, Ambrette, Lemon grass, Eucalyptus citriodora and others, Citronellas, Neroli, Bigarades, etc. It is realised more than ever that oil distillation is a cottage industry well adapted to local conditions. Ylang-Ylang has hardly emerged from the experimental stage, but it has decidedly been proved that the valleys in the low country are more favourable than mountain summits where a large plantation was made in 1927. Cananga oil and Ylang-Ylang oil come from one and the same plant (Cananga odorata). Ylang-Ylang is the first portion of the distillate from very fresh flowers. Cananga oil is the last portion or the whole of the distillate from unripe or over ripe flowers. It is the right plant that has been introduced here from Bourbon very long ago. Attempts to grow it have to be given up on the hills where wind exposure, poor soil and scale insect attack (Asterolecanium pustulans) are too much for it. It has to be grown in the cocoanut zone and its requirements are about the same as those of the breadfruit.

Distillation must be slow and new flowers are added the whole day as it proceeds. When no more flowers are added, the distillation for 1st quality of Ylang-Ylang oil has to stop. If it is continued the second part of the distillate is set apart as Ylang-Ylang of 2nd quality, and finally as Cananga oil at the end of that second distillation. This sort of fractional distillation, which has to be tested every hour, is imperative. In the Philippines 2 litres of 1st quality are

distilled per ton of flowers and 3 litres of Cananga oil. When 10 or 15 litres are distilled in one charge the distillate has to be considered as Cananga oil. By chemical control, the distiller knows if he produces Ylang–Ylang or Cananga oil. The latter oil is insoluble in alcohol and has no or little action on polarised light, while Ylang–Ylang oil is more soluble and deviates polarised light strongly to the left. Samples from Seychelles gave an optical rotation to the left of 18° to 45° at the Imperial Institute.

Ylang–Ylang oil is used in medecine and is particularly valued by Malays for making ointments. In perfumery it is used in the preparation of celebrated extracts such as "Ambre Royal", "Rayon d'or, bouquet à la reine," "heure du berger," etc. It is sometimes worth Rs 60 a litre and deserves a good place in Seychelles in the low country, provided it is grown in the right place.

ARECA NUT. This palm was introduced from Wellesley Province and Pointe de Galles in 1903. It does well in damp valleys and in the so-called marshes properly drained. It will not grow on the hills where, like coconut palms, it is soon attacked by the same scales. A few trees at Government House can be seen growing luxuriantly, producing huge clusters of nuts twice a year. In Ceylon sandy and rocky soils are avoided. The nuts are soaked three days in water then sown in nurseries. The seedlings are set out 8x8 feet or preferably 8x16 ft with an intermediate row of plantains. A second planting of areca nuts is made after 3 years to replace the plantains. The young palms are in that way always shaded. They commence to bear after 6 years and produce a crop of 100 to 400 nuts per tree. This means a crop of about 1 ton per acre which is sold at about Rs 16 per cwt. The nuts are sold in Ceylon either as green tender fruits, as whole ripe fruits, as whole dry nuts or split dry nuts.

TUBA ROOT. This plant was introduced in Seychelles in 1903 from Singapore when even at that time it was much used as an insecticide in Chinese gardens. Since then it has acquired great commercial importance and is being grown in the East for the preparation of a powder or extract which are unrivalled as a contact insecticide. The roots contain about 6o/o of rotenone and it has been found that a mixture of 1 grain rotenone in 300 litres of water effectively controls green aphis. Chickens and dogs are unaffected with 1 grain per pound of body. The variety introduced and already distributed is a creeper (Derris elliptica) and steps are being taken to introduce other varieties of the erect type (Derris malaccensis) which contain a higher toxic content. There are a great many other minor crops which deserves the attention of planters, such as bigarades (citrus mitis), cashew nuts (anacardia occidentalis), Kola nut (Kola nitida) which grow well in the poor soils of the colony. The difficulty is to find a good price for the produce from these plants. Bigarades can be turned into citrate of lime, but the price for citrate is declining, owing to competition with synthetic articles from pineapple waste or even sugar. It would however still pay to manufacture citrate in the Colony. Cashew nuts are already used in confectionery and find an easy market, and especially in the United States. The difficulty is to get a machine to crack the nuts and export the kernels only. The present system of roasting the nuts by fire is too cumbersome. Kola is a tree which is becoming subspontaneous in Seychelles but the difficulty of sending fresh nuts, which do not keep a long time, to West Africa is insurmontable. An extract from the nuts still awaits development.

The difficulty with minor produce is to get the plants established in the proper soils and this has to be learnt by planters from experience. Improper soil conditions unvariably bring up with them inferior produce which are unvaluable and a cortege of insect pests.

IX. Entomological & Mycological Notes.

During the year under review, the following predators on scale insects were identified by the Imperial Institue of Entomology.

1. Rodolia Chermesina.
2. Nephus oblongosignatus.
3. Scymus constrictus var intercisus.

all of which were found on Tephrosia candida attacked by Icerya Seychellarum and on pigeon pea (Cajanus indicus) attacked by Diaspis (Aucalaspis) pentagona. Two other very small black coccinelid beetles were found on banana leaves and coconut husks where Icerya Seychellarum and Aspidiotus ficus were present. They have not yet been identified. The Coccinelid Rodolia chermesina was, I am told by old residents, introduced some 50 years ago from Reunion island at a time when the mealy bug (Icerya Seychellarum) was said to be predominant scale insect on coconut plantations. It is still found here and there on the great many of the host plants attacked by Icerya, but they are manifestly insufficient in number for the control of the parasite which is gaining ground on plants of all kinds other than coconut palms, the latter not being attacked by Icerya, if ever it was. This predator is a well known parasite of the mealy bug, an allied species having been used in other countries for the artificial control of another bug of the same genus, Icerya purchasi, which is a common pest in the orchards of temperate countries. It is presumed that this beneficial insect is destroyed in Seychelles by the common Myna bird (Acridotheres tristis) and is also presumably prevented from doing its work by the small black ant (Technomymex albipes) which nurses and protects the mealy bug from destruction. At any rate guava and other bushes where mealy bugs occur abundantly harbour this coccinelid when they are grown near a bungalow where mynah birds are scattered while it is difficult to find them in the jungle where great numbers of this bird flock together far from habitations. I have written for guidance in this matter to the Imperial Entomologist of India who has already supplied me with interesting data.

There is such an analogy between the biological and climatic requirements of Rodolia and Icerya purchasi in other countries, that it is important that we should know to what extent mynah birds, which are otherwise so beneficial as insect eaters, should in their turn interfere with the acclimatisation in Seychelles of this and other predators which are so badly needed.

This gives an idea of the difficulties attending the artificial control of insect pests in a colony. One is inclined to think that it is very easy to introduce predators from abroad. Those who have studied the difficulties think, on the contrary, that no such work should be attempted without the complete equipment for research, in order to avoid exposing a colony to the invasion of other pests that may be accidentally introduced at the same time, if proper precautions are not taken. Planters who would like to obtain an insight into these difficulties should read the publication of the Empire Marketing Board, No. 29 of June 1930, in which an account of the work done at the Farnham House laboratory is given. This Institution was founded by the Imperial Bureau of Entomology in 1927 by means of a grant from the Empire Marketing Board. Its principal object is to guide the entomologists of the Empire in the control of insect pests of agriculture and forestry by means of natural parasites and predators. It has hitherto succeeded in breeding and distributing 70 species of these beneficial insects. Insect pests may temporarily only upset the balance of nature and die away under natural control without the necessity of introducing new predators which is a piece of work which needs considerable time and money.

Larger colonies than Seychelles are infested with insect pests of an even more alarming nature and in those colonies no steps towards the introduction of predators have yet been taken. The recent establishment of the Farnham House Laboratory 1927 has solved the difficult problem with which small colonies were confronted, the efforts made all over the world having now been centralised and co-ordinated and the extent of the damage which might eventually be done by introducing secondary parasites having been more adequately elucidated.

The local Government has been in constant communication for the last three years through the Colonial Office with the Authorities of the Imperial Institute of Entomology and the question of the appointment of a trained specialised entomologist from Farnham for research work in Seychelles in connection with scale and other insects is under consideration by the Right Honourable The Secretary of State. In the meantime a fungus parasitic on Aspidiotus destructor in Sierra Leone was received in December 1929 from the Imperial Mycological Institute in petri dishes which however has failed to reproduce itself, although the same fungus and its perfect form, Nectria diploa, were discovered at about the same time in various localities at the other end of the island of Mahé and in up country districts. This fungus still does however very little work. The thread scale (Ischnaspis longirostris) which attack coconut leaves is infested with it in 4 localities only. Attempts to contaminate the same hosts elsewhere have failed hitherto from want of equipment. This work as well as that of breeding coccinelid and chalcidid parasites injurious to Ischnaspis longirostris is entrusted to Mr Nageon who underwent for a few months in 1928 a special training in applied Entomology at Trinidad under professor Ballou. He has not hitherto succeeded in breeding in cages and identifying parasites from infested coconut leaves and is now attempting to propagate the Rodolia coccinelid by breeding it on sprouted potato tubers in the laboratory, these sprouts being so easily infested naturally with Icerya bugs.

A considerable amount of information was received during the year from the Malay State, Kenya and Ceylon, Zanzibar regarding our two predominant scales insects that are now causing so much havoc and it was ascertained that these two pests occur in most of these countries without being parasitised by coccinelids and predators. Pinnaspis buxi does not occur in Ceylon, but two allied species occurring there viz : P. Minor and P. Aspidistrae also attack palms and various trees in Ceylon and in Seychelles. The former is parasitised in that colony by the chalcids : Aphelinus diaspidis, Prospaltella aurantii and P. berlesei and also by the coccinelid Chilocorius circumdatus which also attacks Pinnaspis aspidistrae, Aulacaspis flacourtiae, Aspidiotus lataniae and pseudococus which all occur as pests everywhere in Seychelles The introduction of these predators is indicated. Ischnaspis longirostris also attack coconut palms in Ceylon, but no parasite of this scale occurs in that Colony. I am indebted to Mr Jepson of Ceylon for this extremely useful piece of information.

In spite of whatever steps which can be taken for the biological control of the two scales incriminated the necessity of improving soil conditions by manuring at the same time should not be lost sight of. It has been found on many estates that manuring, cultivation and drainage of coconut plantations have relieved them from the attack of the thread scale and that in numerous localities where the hillsides are separated by a valley, the hillsides are infested and the valley remains apparently immune. The importance of the reaction of soil conditions on the behaviour of scale insects cannot be better illustrated.

The thread scale is the worst of the two scales for the present, it attacks coconut virulently on all mountain sides and occurs also in every locality in the low country. When the havoc is slight no notice is taken of it and the bearing of coconut palms is not affected. When the infestation is severe, especially on the hills where soils are poor, the trees cease to bear and the few nuts fall a little before maturity. Soil conditions can hardly be sufficiently improved by manuring on such slopes to guard against this pest. It remains to be seen what predators can do in such places. The thread scale attacks in the colony the following plants besides coconut palm :—

1. Coffee of all kinds.

2. Palms such as Raphia, Latania, Livistona, Elaeis, Dypsis, Stevensonia, Verschaffeltia, Nephrosperma, Roscheria, Cocos flexuosa.
3. Stachytarpheta indica (epi bleu).
4. Cinnamon growing under coconut shade.
5. Calathea sp.
6. Psidium guava.
7. Mango.
8. Anona reticulata.
9. „ muricata.
10. Maranta arundinacea.
11. Ficus nautarum.
12. Ixoras.

The other yellow scale pinnaspis buxi or pandanus scale occurs nearly everywhere here. It was found in Felicité on pandanus in 1920, vide Bulletin of Entomological research September 1921 p. 125, although none of it occurs there at present, on coconut palms. This scale, unlike the thread scales attacks no other plants than Pandanus, palms and Calathea and except in N. Mahé where it still prevails to an alarming extent in worn out soils. It seems to be kept under control by natural parasites following rainy weather and has lost much of its virulent character. Other scales which used to attack coconut palms in the colony such as Aspidictus ficus, A. lataniae, A. dictyospermi, A. trilobitiformis, A. ansei,, Lecanium tesselatum, and Mytylaspis sp. have lost their virulence in the same way after years of serious disaster.

Among other specimens identified at the Imperial Mycological Institute during the year the following are mentioned.

1. a Marasmius which looks very much like M. palmivorus, so injurious to coconut palms in Malaya.
2. a fungus on white mangrove at Aldabra (Avicennia officinalis) identified as Fomes rimosus.
3. a fungus on bois manioc (Scaveolo Koenigii) at Providence identified as Lentinus Sajor. Caju.
4. Pleurotus sp. was identified as occurring on dead stems of coconut palms at Desroches Island and Ganoderma applanatum on the same plant at Pointe Larue.
5. Sphærostible coccidophthora was identified on twigs of mango and coconut leaf at La Misère. This fungus was identified by Dr Petch 15 years ago on Flacourtia twigs attacked by Aulacaspis pentagona at Capucin. It is a well known fungus on chionaspis and chrysomphalus scales in other countries. It is much like the pseudomicrocera fungus newly introduced, Microcera aurantiicola also occurs at Misère. Verticium heterocladum was identified at the Mycological Institute as an entomogenous fungus on Aspidiotus ficus.

The statement made in several of the annual reports published by this department as regards the necessity of draining the so called marshes and water logged "plateaux" where coconut plantations are made everywhere in the Colony, still deserves the consideration of the planters. No planter has however taken up this advantage which has to be supplemented by laying the well-known Calco Culvert and automatic gates which would prevent the outlets to the sea and on these plateaux from being blocked up by sand bars at intervals. These culverts and gates are supplied by the California Corrugated Culvert & Co, Berkeley, California, U. S. A. who are represented in Ceylon by Messrs Hayley & Kenny of Colombo, and in Mauritius by Mr Collingridge of Port Louis. Many booklets from this company describing the methods of drainage with costs have on several occasions been distributed here without success. Without proper drainage a large part of the best coconut soil in the Colony, extending over 3 thousand acres, will remain the breeding ground of insect pests, water logging and acidity, rendering the trees grown therein most susceptible to disease. Several estates at Anse aux Pins and Crève Cœur were reported to be suffering during the year from coconut leaf disease on the hill sides. In each case it was found that a particularly damp undrained valley was the initial cause of the trouble which was followed by an attack of various fungi, of scales and of the weevil (Eugnoristus Braueri) which bores into the leaf stalks of the palms occasionally. The parasitic fungi were found to be mostly Thievalopsis paradoxa to which most of the leaf bitten coconut disease is principally due. In several cases the little leaf disease was found also to occur. Both these fungus diseases which are less common in the Colony than formerly lead to bud rot. The owner of the plantations that were suffering from them were advised to drain the land, to burn the infested material after cutting twice over the unfolded leaves showing sunken spots following fungus attack. These plantations have recovered since then. This bud rot type of disease occurs spasmodically in Seychelles and has been found everywhere even in the Outlying islands for the last 30 years and it is essential that planters should report at once the outbreak of such a contagious disease to the Department of Agriculture.

X. Livestock.

The importation of pure bred animals for the improvement of livestock in the Colony has long been under consideration, but it is in 1930 only that funds to the amount of Rs 500 a year were provided for that purpose. The first step taken was to improve dairy cattle which is of so great importance for the health of the inhabitants. The Department of Agriculture in Mauritius was requested to supply a selected pair of Friesian cattle which were successfully imported in March 1930, after remaining in quarantine 6 months under charge of a veterinary officer in that Colony, in order to avoid the possible introduction of Surra disease at the same time. The bull calf and the heifer arrived on board a schooner after remaining 30 days at sea and when they landed they were far from being in good condition. They were put under observation during a whole year at Cerf island where a planter, Mr Samuel Calais, volunteered to look after them and where they were provided with fly proof cowhouses and inspected every week. After that time they became a very fine pair of animals. They will be removed to the Botanic Station in February 1931.

Both are the direct off spring of champion animals from Johannesburg and were carefully selected by the manager of the Government Dairy farm of Mauritius to whom I am under obligation.

They are fed with pasture grass which is plentiful and a small amount of indian corn and coconut cake, after having been fed for the first 8 months with imported feed from South Africa to which they were accustomed before.

The litterature on the subject of Friesian cattle convinced me long ago of the necessity of importing that breed in preference to other breeds and my impression was strengthened when I saw and studied the imported animals in Mauritius in 1927.

Originally derived from the province of Friesland in North West Holland which is the home of this breed, it has succeeded in the tropics beyond expectations and now stands as the premier milk producing breed in the world, even in Europe and America, while in Australia, South Africa, Ceylon, India, Hong-Kong, Mauritius, Dutch East Indies, West Indies, Malaya, it has been shown that they not only keep their dairy characteristics, but transmit them to their descendants, even when grading up cattle with a high percentage of Zebu blood is desired. Among other characteristics it is said that this breed is easy to handle, docile, able to consume and turn into milk large quantities of rough fodder and bulky food, while yielding milk to the amount of 8 to 20 litres a day, even in Mauritius.

I considered that it was advisable to introduce cattle from Mauritius and not from elsewhere when I knew that my colleagues there (where I spent 2½ years) would do their best to help me and reduce to a minimum the danger of introducing Surra disease into Seychelles where one stomoxys fly is very abundant.

Not having the services of a veterinary surgeon in the Colony it was considered essential to rely upon more assistance from friends in Mauritius, in order to avoid the introduction of a dreadful calamity of that kind. It was also considered that, without the guidance of a veterinary surgeon, it was safer to introduce animals from Mauritius than from South or East Africa where so many other diseases prevail. The newly introduced specimens were examined carefully and would have been treated with soamin and arsenious acid or destroyed had they shown any sign of the Surra disease. They are now about 3 years old and in the pink of condition.

Time has come for the training of one of our laureates or even one of our sanitary inspectors at Pretoria and Onderstepoort which are celebrated institutions for the teaching of veterinary science and animal breeding. I know an officer in Mauritius who belongs to the Agricultural Department and who after one year's study at Onderstepoort had singularly improved the knowledge in animal breeding he had acquired previously at the Agricultural College of Mauritius.

During the year 1931, no steps will be taken for the importation of other improved breeds of animals and birds, as the Colony is suffering heavily from a depression in the copra market. But this useful piece of work will be resumed as soon as possible as the local breed of other animals have also to be seriously improved.

A fine breed of domestic pigeon (Mandarin) was introduced from Mauritius in 1927 and being propagated. The next step seems to be the necessity of importing pure bred pigs and poultry. This Colony is well known as being the home of pigs which at one time were exported to Mauritius. Every inhabitant has a pig tied to a tree and is feeding it well. It is not well known that pigs in this Colony are also fed on a weed Asystasia Coromandaliana introduced from India in 1911 when other feeds such as coconut cake, yams, breadfruit &c., are scarce. By a singular coincidence another asystasia (A. scandens) has been reported this year (1930) in British Guiana as being one of the best fodder grasses, containing more mineral elements than all other pasture plants of that Colony including Elephant grass. Another piece of work which is contemplated in connection with improvement of local breeds is an attempt towards gradually replacing the goats of Aldabra where they number several thousands in the jungle by the Black Head Persian sheep in order to supply the market of Mahé with mutton. Very few people consume the Aldabra goats, although they give excellent meat when they are properly fed. Mutton meat is however so much better that the pastures of Aldabra, which amount to several thousands of acres, should be turned to better advantage for the welfare of the inhabitants.

One must not lose sight of the urgent necessity of restoring humus to the lateritic soils of the Colony. At present not more than 12,000 tons of cattle manure and cinnamon refuse are produced, while some 3,000 tons only of sea weeds are collected on the beach, making a total of 15,000 tons. A lot more is needed, as there are 28,000 acres under coconut only and as 20 tons of manure are required per acre every 3 years, making 7 tons per year per acre or nearly 200,000 tons in all, until the time comes when more green manure will be dug in.

The question of developing bee keeping in the Colony is under consideration. The indigenous bees do little or no work and store very little honey. Italian bees which do much better work here were on several occasions introduced from Italy by the Brothers of the St Louis College who are keen apiculturists. It is however very difficult to get bees to arrive safely from Italy via Aden and Mombasa, owing to the long sea journey, and most of the recent introductions have failed. The Government are taking up this matter in hand mostly for the sake of avoiding the introduction of Acarine disease (foulbrood) and on consultation with the Director of The Imperial Institution of Entomology an order has been placed with the well known Queen breeder of Bologna, Italy, Mr Enrico Penna, for transmission of a number of Queens by air mail to Karachi and transhipment by steamer to Mahé. Bee keeping is another small industry which is very successful here and the produce can be disposed of easily on board the B. I. steamers where the demand still exceeds considerably the supply.

XI. Fisheries.

The following articles from the Outlying islands were exported during the year as compared with the previous year :—

		1929.	1930.
Guano	tons ...	12,780	15,977
Tortoise shell	kilos ...	995	1,335
Calipee	,, ...	4,226	3,570
Shark fins	,, ...	865	1,095
Trepangs	,, ...	6,061	9,647
Green turtle shell ...	,, ...	633	nil
Salt fish	,, ...	nil	,,
Turtle strips	,, ...	1,314	2,567
Birds' eggs (preserved yolk and white)	,, ...	29,170	84,227
Fresh fish	,, ...	1,043	nil
Turtle oil	litres ...	nil	4,225

No fresh fish was exported during the year to Mombasa, but arrangements are being made to resume this exportation as soon as a fish refrigerating plant will be established. The Colony is already provided with a small A. S. refrigerating machine owned by the firm Union Lighterage & Co. Ltd. for the supply of ice to the town of Victoria. Experiments were made in 1929 by the firm of Baty-Bergne & Co's Successors who succeeded in exporting 1,043 kilos of fresh fish during a few months. The same firm has launched an auxiliary vessel provided with ice chests and also possesses several motor launches for fishing on the Mahé and Amirantes banks.

The B. I. Steamers are now provided with cold storage accommodation to the amount of 40 to 200 tons per steamer. It is proposed to use a shed on the Long Pier where formerly Kerosene and dangerous goods were stored, but which is no longer required for that purpose. The present shed measures 30'x 70'x 12' and can be easily transformed into a cold stora with very little extra accommodation for the engine room, landing platform and air lock room being needed.

The acquisition of a refrigerating machine producing 1,100 to 1,250 lbs of ice per 20 hours and supplying the cold brine for the refrigerating room is under consideration at a cost of £1,600 by His Excellency The Governor who is giving to enterprising firms interested in fisheries the utmost assistance that can be afforded by the Colony.

Already about a ton of fresh fish is purchased from the market and sold by a contractor to each mail steamer bound for the African ports calling at Mahé. The fish are roughly gutted and put in the cold storage.

Since the passing of the new Ordinance No. 7 of 1929 which regulates fishing in Seychelles and prohibits fishing with large nets in the reserves the amount of inshore fish caught by lines and basket nets has considerably increased. Within 18 months the fish captured even with lines from the beach were found to be 3 times larger and the new law is already proclaimed as being a blessing to the inhabitants. No apprehension is felt as to whether the interests of the inshore fishermen will be jeopardised by new fishing operations with motor boats. All authorities agree that it is a misconception that refrigeration rises the price of fish unfairly. It has been proved on the contrary that refrigeration serves to spread the supply over the year at a comparatively uniform price and has nothing to do with the interaction of supply and demand which fix the price of all commodities. There is a local proverb which runs as follows :—

"Saison maquereaux
"Saison carangue
pas bisoin la pêche"

which in the language of the fishermen means that when shoals of mackerel and caranx appear, there is no need of fishing. Fish that otherwise would be dumped are saved by refrigeration which therefore is an inducement rather than an obstacle. With fish at 2 to 5 cents a lb, which are sold at 40 cents on board steamers, there is a scope for the development of fisheries and its by-products : fish meal, fish guano, fish oil &c., which have been too much neglected in the past. Fish liver oil cannot be dispensed with nowadays in poultry raising and other industries.

A few salt fish cured by new methods were found in Zanzibar to be exceptionally good and every effort will be made in the colony to resume the exportation to East Africa of salt fish cured in Seychelles which is superior in quality to any fish derived from the Persian Gulf.

There are only 2 species of turtle known to occur in Seychelles, although it is believed that the loggerhead (Thalassochelys caretta) which occurs in Madagascar is sometimes captured by fishermen at Aldabra. According to fishermen yarns another turtle (possibly Sphargis ariacea) from Madagascar also occurs sometimes, although it is supposed by them to be a hybrid turtle which they call "Vacoa". That the Seychelles archipelago constitute excellent breeding grounds for turtles is too often forgotten and little advantage is still derived from the herds of green turtle that come ashore on all islands, especially those that are not inhabited. In Madagascar they are protected by law on 6 islands, including Europa, where their capture is prohibited. Nothing is known concerning the migratory movements of these reptiles from Africa and Madagascar to Seychelles, but the calm and land locked waters of this Colony seem to induce them to visit periodically our shores to lay their eggs much more than in Madagascar where the depletion is more marked. It is supposed that the eggs are laid 3 times a year mostly from October to April, but nobody knows whether they do not lay more often their eggs during the other seasons of the year. There is such a lot of meat and oil wasted out of the 6,000 turtles captured every year in Seychelles, the salted meat not keeping properly and being sometimes sold as manure, that new steps have to be taken to take better advantage of these natural resources which are almost unique in the world.

When guano occurs on islands so far out at sea, such as ours, there is always an abundance of plankton in the inshore waters on which fish feed, the latter being in their turn captured by birds which begin the cycle over again. These conditions warrant the fish and turtle resources being more fully utilised than in the past, but sanctuaries and breeding grounds should be established and reserved in order not to allow the recurrence of such sad results as the extinction of rare animals like the Dugong (Halicore Dugong) and the special variety of hawk-bill turtle that used to breed exclusively in the lagoon of Aldabra. This department is indebted to the authorities of the British Museum Ministry of fisheries, Imperial Institute and Empire Marketing Board for a good deal of information regarding the breeding of turtles and preparing calipee and turtle meat for the market. This information has been communicated to the firms interested in fisheries.

XII. Crown Lands.

The following plants were set out during the year on the Crown Land reserves.

Mahé, Niol Crown Lands : —

Gum copal (Trachylobium verrucosum)	400	seedlings
Kapok	100	,,
Casuarina equisetifolia	1,253	,,
Chrysobolanus icaco	5,000	,,
Raphias	300	,,
Bois de table (Heritiera littoralis) ...	400	,,
Takamaka (Calophyllum inophyllum)	450	,,
Sang dragon (Pterocarpus indica)	292	,,
Santol (Sandoricum radiatum)	150	,,
Parkia roxburghii	275	,,
Agati (Adenanthera pavonina microcarpa) ...	2,130	,,
Cassia florida from Mauritius	40	,,
Gayac (Afzelia bijuga)	21	,,
Neroli (citrus Bigaradia)	200	,,
Palmyrah palm (Borassus flabelliformis)... ...	30	,,
Latanias and other palms	5,000	,,
Aleurites Fordii (Tung oil)	90	,,
Various fruit trees, such as Chrysophyllum cainito		
Oranges, genip (Melicoca bijuga)	80	,,
Mangoes (imported)	42	,,
Mangosteen	30	,,
Sweet sop	60	,,
Custard apple	35	,,
Cherimolia	45	,,
Avocado pears	2	,,

Praslin Crown Land reserves :—

Coco-de-Mer	471	seedlings
Calophyllum inophyllum...	700	,,
Badamier (Terminalia catappa)	310	,,
Tecoma leucoxylon	522	,,
Adenanthera pavonina	300	,,
Casuarina equisetifolia	253	,,
Cinnamon	800	,,
Heritiera littoralis	130	,,
Hernandia peltata	7	,,
Sang-dragon (Pterocarpus indica)	92	,,
Various palms and fruit trees	121	,,

The crown lands of Praslin are all leased with the exception of what remains of the coco-de-mer valleys, after an exchange which was made in 1919 by Government with Mr d'Emmerez de Charmoy for the acquisition of Hermitage estate in Victoria where the New Hospital is now built. At Marie Louise and Fond Ferdinand the nucleus of the coco-de-mer groves measuring 40 acres was reserved and the same extent was set aside at Fond Boffay when this Crown land together with Fond Azor were also exchanged for Hermitage Estate. A small portion of Fond Azor known under the name of Le Vague, measuring 4 acres was also reserved at the time when Government parted with the Praslin crown lands. The reserves at Marie Louise and Fond Ferdinand since then (1919) had been leased, but it was decided this year (1930) after expiry of the lease, not to renew it and the coco de mer valley is now being looked after by the Agricultural Department. This measure of precaution against the likelihood of the Government coco-de-mer reserves becoming derelict was adopted after it has been considered unnecessary to purchase Midlands valley where the best grove of coco-de-mer palms still occurs in the Colony. Midlands valley, as already stated in my previous reports, follows Midlands public road and Midlands river all the way from Bay St Anne to Grand' Anse and as these valleys are moist and still under jungle the environmental conditions, which are necessary for the preservation of the coco-de-mer, are at their best. The Marie Louise valley is surrounded on all sides by small settlers who possess land between the valley and the mountain ridge where shifting cultivation and bush fires still prevail and the consequence is that this coco-de-mer valley is more or less exposed to conflagration and erosion of the land with its cortege of insect pests. The environmental conditions at Marie Louise are below par and steps are being taken to improve them by cultivation and by putting a great many trees on the boundaries, as a protection against fire and erosion.

The proportion of male and female trees in the valley is the following :—

	Males	Females in bearing.	not in bearing.
Anse Marie Louise ...	292 ...	230	31
Fond Ferdinand ...	261 ...	168	38

At Fond Boffay, Le Vague, Curieuse Island and other leased Crown lands that are unsuitable for the coco-de-mer palms there are still a few dozen trees which are protected from destruction. Funds, however, do not permit much more at present than to protect the main valley from destruction in which no less than 370 coco-de-mer seedlings were set out during the year, in addition to forest trees. Some 182 nuts were also transported to Mahé where they are also set out in the jungle at Niol and at the Botanic Station. The replanting of coco-de-mer palms in the Colony has become a necessity, as Midlands valley itself is being deforested and the coco-de-mer palms therein are in consequence rapidly deteriorating. Midlands which not more than 2 years ago was adorned with ferns, pandani and palms all the way from Fond Boffay to Nouvelle Découverte is assuming the appearance of a savannah district and already the reeds (Carex & Cyperus) are replacing the ferns and mosses alongside the road. It is a mistake not to have preserved this beautiful and unique valley in its natural state.

Owing to the very bulky nature of the coco-de-mer nuts (weighing 20 lbs each) it has not been found possible to interest the heads of our tropical gardens in the propagation of this unique palm elsewhere, in the way that seeds of the rare palms from Lord Howe Island are disposed of under Government control in Australia. The most, however, is done when a direct steamer leaves Seychelles for other parts of the Empire to interest a passenger or the Captain of the steamer to transport free of charge one or two casks containing fresh coco-de-mer nuts.

In Mahé also the forest reserves were from 1921 to 1926 leased for the exploitation of cinnamon leaves and bark with the fatal consequence that much denudation took place, cinnamon trees predominating in the jungle at high elevations. These leases have been cancelled in 1927 and no more exploitation of leaves and bark are allowed in the catchment areas, where most of the rivers of Victoria take their rise. The reafforestation of these summits is steadily progressing. Besides Cocoplum (Chrysobolanus icaco) and gum copal (Trachylobium verrucosum) which at one time were the only hardy plants that would grow on a land rendered sterile by erosion and bush fires it has been found that Australian Acacias (A. confusa & A. Polystachya) are substitutes for these plants. These acacias being leguminous plants will soon restore fertility to these barren summits and they, in addition, produce excellent firewood on private estates as quickly as casuarina that is more and more needed for our distilleries. Another small tree from Malaya (Memecylon coeruleum) has also been found this year to be convenient for reafforesting worn out areas in the low country.

Among the new forest trees that are being propagated, it is worth mentioning that an abundant crop of seeds of Khaya grandifollolia was obtained this year at the Botanic Station. This plant which belongs to the Mahogany Group of African timber seems to be hardy and self reproductive. It is worth a trial in a country where good timber is so scarce that Government has had again this year to supply at cost price to the Public Works no less than 14,697 current feet of Capucin from the reserves, where so few of these trees are left. Pentadesma butyracea is also a tree which forms a miniature forest by itself by growing from root suckers all round the mother plant. It is being also propagated, although it does not often bear fruit.

XIII. Excise Return.

The area under sugar cane cultivation and for which a licence of Rs 250 per acre has to be taken amounted to 20·9 acres and 1,765 sq. ft. distributed as follows :—

	Acres	Tenths	Square feet
North district ...	10	2	825
South district ...	8	9	1,462
Praslin	1	7	3,764
La Digue ...			257

compared to 26 acres—1,375 square feet in 1929.

The number of bacca mills registered during the year amounted to 10 and 15 licences were issued to retailers of bacca.

The number of essential oil distilleries for which a licence of Rs 60 per annum has to be taken (Ord. No. 1 of 1923) amounted to 82.

The revenue derived from the taxes and licences are :—

Sugar cane plantations (Rs 250 per acre)	...	Rs	5,260.30
Bacca mills (Rs 100 per annum)	...	,,	1,000.00
Tax on mill oxen (Rs 3 p. a.) ...	...	,,	30.00
Bacca shop licences (Rs 180 p. a.)	...	,,	2,700.00
Essential oil distilleries (Rs 60 p. a.)	...	,,	4,920.00
	Total	Rs.	13,910.30

Seychelles, 21st April 1931.

P. R. DUPONT,
Director of Agriculture.